HE
203
.A56
no.
83-01

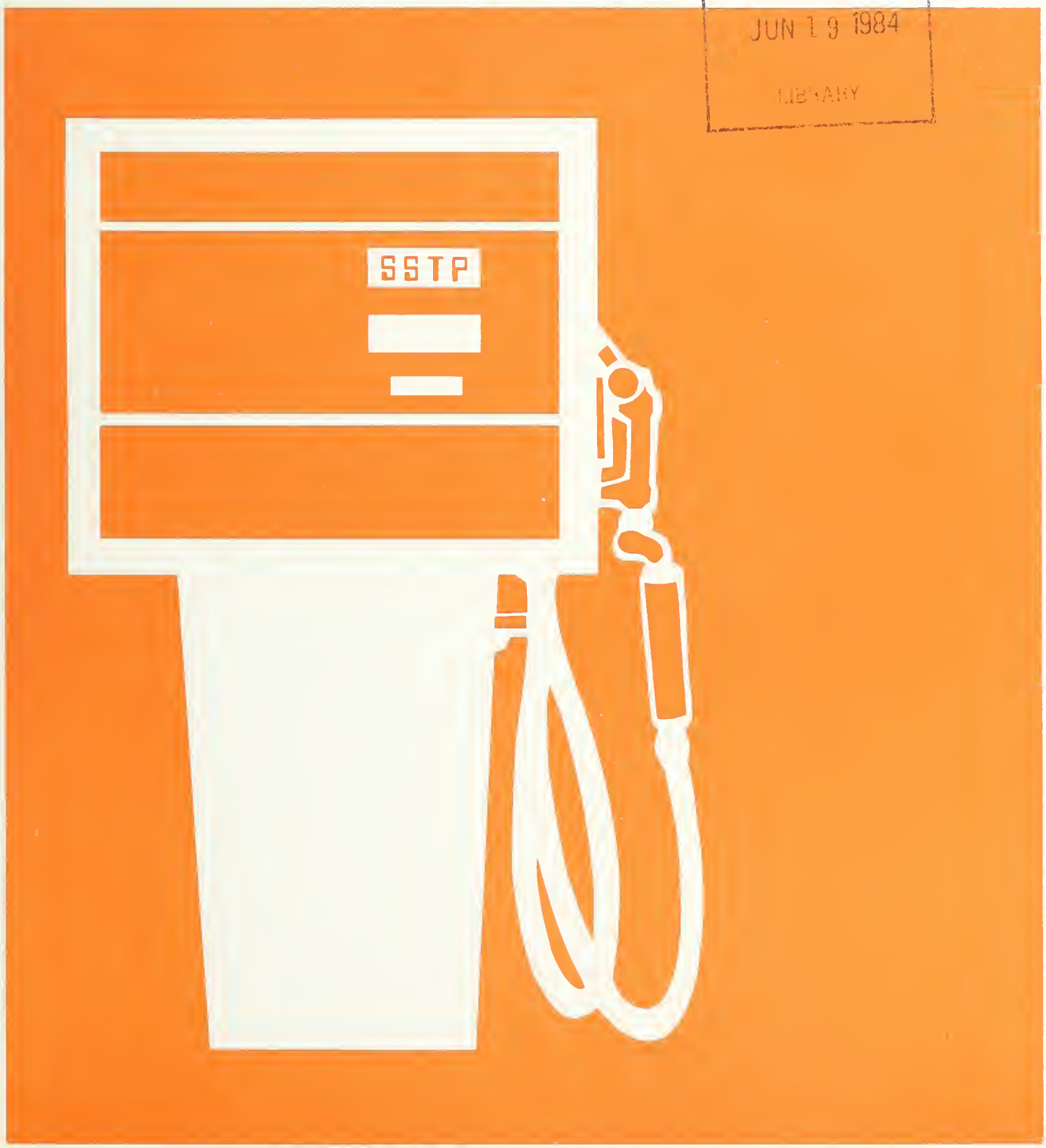
U.S. Department
of Transportation

Transportation Energy Management:

Current Transit Operator Activities

September 1982

DEPARTMENT OF
TRANSPORTATION
JUN 19 1984
LIBRARY



3-01

Transportation Energy Management:

Current Transit Operator Activities

September 1982

Prepared by

Municipality of Metropolitan Seattle (METRO)
821 Second Avenue
Seattle, Washington 98104

DEPARTMENT OF TRANSPORTATION
JUN 19 1984
LIBRARY

Prepared for

Office of Planning Assistance
Urban Mass Transportation Administration
Washington, D.C. 20590

In cooperation with

Technology Sharing Program
Office of the Secretary of Transportation

DOT-I-83-01

FOREWORD

The rapid increase in the price of energy during the 1970's has significantly increased the importance of these expenditures in transit operator budgets. For 1981, the Section 15 report indicates that transit properties spent 10.2 percent of their operating budgets, or about $670 million on fuel and utilities. Expenditures of this magnitude imply a need for careful attention to their reduction through improved management.

Transit operators have become increasingly aware of this problem. Thus many operators have initiated a variety of activities designed to improve management of their energy use. This report provides a compilation of these activities developed by the Municipality of Metropolitan Seattle. We believe it will be useful to other operators interested in assessing their own energy management activities by providing information about recent experiences in this area.

The Urban Mass Transportation Administration is also developing a number of other materials designed to provide technical assistance on this topic. They will be distributed as they become avialable.

Additional copies of this report are available from the National Technical Information Service, Springfield, Virginia 22161. Please refer to UMTA-WA-09-0034-83-1 on your request.

Charles H. Graves
Director of Planning Assistance
Urban Mass Transportation Administration
U.S. Department of Transportation
Washington, D.C. 20590

Alfonso B. Linhares
Director of Technology and Planning Assistance
Office of the Secretary of Transportation
U.S. Department of Transportation
Washington, D.C. 20590

ACKNOWLEDGEMENTS

This report was prepared by the energy staff of the Municipality of Metropolitan Seattle (Metro). The American Public Transit Association (APTA) provided space for a notice in **Passenger Transport** to encourage participation in the survey. Financial support was provided by the Urban Mass Transportation Administration (UMTA). However, the views expressed herein do not necessarily reflect those of APTA or UMTA.

September, 1982

TABLE OF CONTENTS

		Page
I.	EXECUTIVE SUMMARY	1
II.	SURVEY METHODOLOGY AND RESPONDENT CHARACTERISTICS	3
III.	SUMMARY OF SURVEY RESULTS	7
	A. Energy Crisis Contingency Planning	7
	B. Energy Conservation: Operating Facilities	11
	C. Energy Conservation: Rolling Stock	19
	D. Energy Conservation: General	23
	E. Fuel Supply and Price Protection	25
IV.	SURVEY QUESTIONNAIRE	

LIST OF TABLES

		Page
Table 1:	Respondent Characteristics - Location by State	4
Table 2:	Respondent Characteristics - Fleet Size	5
Table 3:	Respondent Characteristics - Population of Service Area	5
Table 4:	Elements of Energy Crisis Contingency Plans	10
Table 5:	Rationales For Not Having a Contingency Plan	11
Table 6:	Energy Conservation Measures Implemented or Planned	12
Table 7:	Most Successful Conservation Measures	15
Table 8:	Actions to Reduce Heat Loss Through Service Doors	17
Table 9:	Annual Energy Use in Transit Facilities	18
Table 10:	Elements of Driver Training Programs	20
Table 11:	Fuel Conservation Measures Implemented or Planned	21
Table 12:	Most Successful Fuel Conservation Measures	22
Table 13:	Elements of Conservation Awareness Programs	24
Table 14:	Response to Conservation Programs	24
Table 15:	Measures to Protect Against Fuel Supply Disruptions	26
Table 16:	Measures to Protect Against Fuel Price Increases	26

CHAPTER I

EXECUTIVE SUMMARY

This report describes the results of a national survey of energy management activities undertaken by 100 transit systems in the United States and Canada. Participants in the survey reported on activities in five areas:

- Energy crisis contingency planning,
- Energy conservation in bus maintenance, repair and operating facilities,
- Energy conservation for petroleum-fueled bus fleets,
- Energy conservation awareness programs, and
- Fuel supply and price protection strategies.

The response rate to the survey of 36.4 percent, and the individual responses themselves indicate considerable interest in energy conservation and related issues.

Highlights from the survey are listed below:

- Half the survey participants have an energy crisis contingency plan, though only three have ever implemented their plans. Two-thirds of those systems with contingency plans received some sort of financial or technical assistance.
- As many as four-fifths of the survey participants have implemented one or more measures to save energy in bus maintenance, repair and operating bases. Among the more popular measures--those implemented by more than 50 percent of the respondents--are actions designed to improve the efficiency of the heating, ventilating and air conditioning (HVAC) systems, such as adjustments to thermostats and shutting off the HVAC system when the building is unoccupied, or to improve lighting systems by installing more energy efficient bulbs and fixtures and providing local switches for better control of lights.
- Two-thirds of the participating transit systems report that open service doors in bus maintenance bays are a major source of heat loss. Slightly more than half have attempted to solve this problem by implementing an employee awareness program to keep the doors closed. Other strategies include installing automatic photo-cell door openers, infrared heating systems or plastic strips in the door opening.
- Fifty-five percent of the respondents have already implemented or plan to implement a driver training program to encourage fuel-efficient driving practices.
- In addition, survey participants report a variety of actions designed to increase the efficiency of petroleum-fueled bus fleets. Among those actions

undertaken by 50 percent or more of the respondents are intensified preventive maintenance programs; increased monitoring of fuel records; switching from exclusive use of #1 diesel to #2 diesel, or a mix of both; and more frequent routine maintenance, like tune-ups, wheel alignment and tire pressure checks.

- Two-fifths of the survey participants have already implemented or plan to implement an employee conservation awareness program, consisting of elements such as employee suggestion programs and signs and notices to promote energy conservation. However, respondents report mixed support for such conservation efforts.

- About a third of the participating transit systems have constructed, bought or leased a reserve supply of diesel fuel as protection against supply distributions. Most of these reserves are for less than 50,000 gallons, representing up to a month's operating requirements.

- More than half the respondents believe the loss of the U. S. Department of Energy's Special Rule #9, which had assured surface mass transit of 100 percent of its fuel requirements in the event of a supply disruption, to be a serious matter. In addition to acquiring their own reserve supply, as many as half the respondents have adopted one or more measures to ensure adequate supplies of fuel in an emergency.

CHAPTER II

SURVEY METHODOLOGY AND RESPONDENT CHARACTERISTICS

The Energy Management Survey was designed to provide a general overview of the existing and planned energy management programs undertaken by transit agencies in the U. S. and Canada. The survey focused on activities in five areas:

A. Energy crisis contingency planning,

B. Energy conservation in bus maintenance, repair and operating facilities,

C. Energy conservation for petroleum-fueled bus fleets,

D. Energy conservation awareness programs, and

E. Fuel supply and price protection strategies.

The survey grew out of a comprehensive energy management program being developed by Seattle Metro, with the assistance of a planning grant from the Planning, Research and Evaluation Division of the U. S. Urban Mass Transportation Administration. Information from the survey is being used in the development of Metro's energy management program and in the preparation of a series of technical assistance guidebooks that will be available to other transit systems.

The survey was conducted during April and May of 1982. A total of 294 public and private transit systems in the United States and Canada received self-administered questionnaires. The mailing list was drawn from the 1982 Membership Directory of the American Public Transit Association (APTA). Of those contacted, 108 responded to the survey. However, since the survey focused solely on bus operations, eight of the respondents were deleted from the survey analysis because they are not currently in operation or, as ride-sharing authorities, administrative agencies or rail-only systems, do not operate any buses. With all such systems deleted, the survey population numbered 276. One hundred of these responded, for an overall response rate of 36.4 percent. Because of the high response rate, no follow-up of non-respondents were conducted.

Tables 1, 2 and 3 show the distribution of the survey participants in terms of location by state, the number of buses operated by the system and the population of the service area. Information for Tables 2 and 3 was obtained from the 1982 APTA Membership Directory.

TABLE 1: RESPONDENT CHARACTERISTICS - LOCATION BY STATE

State	Number of Respondents
Alabama	0
Alaska	3
Arizona	1
Arkansas	0
California	11
Connecticut	2
Colorado	2
Delaware	0
District of Columbia	1
Florida	3
Georgia	1
Hawaii	1
Idaho	0
Illinois	1
Indiana	1
Iowa	2
Kansas	2
Kentucky	2
Louisiana	2
Maine	0
Maryland	1
Massachusetts	4
Michigan	5
Minnesota	2
Mississippi	0
Montana	1
Nebraska	1
Nevada	1
New Hampshire	0
New Jersey	0
New Mexico	0
New York	5
North Carolina	2
North Dakota	0
Ohio	4
Oklahoma	1
Oregon	1
Pennsylvania	6
Puerto Rico	0
Rhode Island	0
South Carolina	0
South Dakota	0
Tennessee	2
Texas	8
Utah	0
Vermont	0
Virginia	3
Washington	5
West Virginia	1
Wisconsin	4
Wyoming	0
Total U. S.	93
Canada	7
Total Sample	100

TABLE 2: RESPONDENT CHARACTERISTICS - FLEET SIZE

Number of Buses	Number of Respondents
1 - 25	22
26 - 50	20
51 - 100	12
101 - 200	13
201 - 400	11
401 - 600	5
601 - 800	7
801 - 1000	3
1000+	7
Total	100

TABLE 3: RESPONDENT CHARACTERISTICS - POPULATION OF SERVICE AREA

Service Area Population	Number of Respondents
25,000 or less	2
25,001 - 50,000	5
50,001 - 100,000	15
100,000 - 250,000	23
250,001 - 500,000	18
500,001 - 1,000,000	18
1,000,000 or more	19
Total	100

Each transit system received a survey packet addressed to the contact person indicated in the APTA Membership Directory. The packet was made up of an introductory cover letter, a questionnaire and a self-addressed, postage-paid return envelope. Preceding the mail out of the survey packet, a notice was placed in **Passenger Transport** to alert APTA members to the research project.

The survey materials were mailed on March 23, 1982. Recipients were asked to return the completed questionnaire by April 23rd. However, tabulation of the survey results was postponed several months so that late respondents could be included in the final report.

The questionnaire was designed so that it could be easily and quickly completed. A checklist format was used, with space provided for additional comments. The questionnaire was divided into five sections, corresponding to the energy management activities listed above. Recipients were asked to pass the questionnaire on to the person or persons most familiar with the system's energy management activities. They were also asked to indicate who might be contacted for follow-up information.

The results of the survey were presented in a narrative form, accompanied by appropriate tables. The report is organized according to the five sections of the questionnaire, with separate sections for each item. Responses for a given question do not always equal the total number of respondents since some did not answer every question or provided multiple answers to others. A sample questionnaire is included at the end of the report.

CHAPTER III

SUMMARY OF SURVEY RESULTS

A. ENERGY CRISIS CONTINGENCY PLANNING

Systems With Contingency Plans (A-1)

Exactly half of the respondents report that their agency has an energy crisis contingency plan. A greater proportion of the larger systems, in terms of fleet size, have contingency plans than those with fewer buses. For instance, among systems with fleets of 50 or less, slightly less than two-fifths (38 percent) have a plan, while among systems with 51 or more buses, three-fifths (59 percent) do. Systems with 200 or more buses report an even larger proportion of plans--64 percent.

Implementation of the Contingency Plan (A-2 - A-3)

Only three systems have ever implemented their contingency plans. Of these three, one ranked the plan's performance as fair and the other two characterized its success in meeting the demands of a crisis as indeterminate. All three plans were put into effect during the 1979 energy crisis.

Development and Revision of the Plan (A-4 - A-6)

Most plans were developed in 1979 or later. Only four systems developed their plans between 1976 and 1978. The other plans were developed in fairly even proportions in 1979 (15), 1980 (11) and 1981 (13). Only one system developed a plan in 1982. A third (32 percent) of the 50 respondents with contingency plans have revised or updated the plan since its development, mostly during 1981 and 1982. About the same proportion (36 percent) report that their plans are currently in need of revision or further updating.

Length of Crisis for Which Plan is Designed (A-7)

In describing the nature of their plans, two-thirds (68 percent) of the 50 systems with contingency plans have plans designed to deal with both short and long-term crises, while only a fifth (18 percent) of the plans are designed to deal solely with a short-term crisis lasting 6 weeks or less.

Crisis Response Actions (A-8 - A-9)

Respondents were asked to indicate what actions they plan to take in each of six crisis response categories. The categories, along with the number of respondents reporting planned actions in each, are shown in Table 4.

TABLE 4: ELEMENTS OF ENERGY CRISIS CONTINGENCY PLANS

Description of Element	Number of Responses
o **Actions to Expand Ridership**	
- Curtail low ridership routes and concentrate equipment on high-demand routes	42
- Utilize excess ridership capacity	41
- Increase number of coaches in service	39
- Promote flex-time, variable work hours	36
- Promote car and/or van pooling	33
- Something else:	13
- Short loop buses in Central Business District and at rail stations	
- Promote shared-ride taxi service and paratransit	
- Obtain priority lanes for high occupancy vehicles	
- Expand park-and-ride lots and increase service to most overloaded lots	
- Expand public information and marketing efforts	
- Eliminate some bus stops	
- Reduce fares	
o **Actions to Obtain Additional Equipment**	
- Reduce spare ratio	33
- Activate reserve fleet	31
- Use school buses	19
- Lease coaches from private carriers, other operators	15

TABLE 4: ELEMENTS OF ENERGY CRISIS CONTINGENCY PLANS (Continued)

Description of Element	Number of Responses
- Something else:	7
- Use church buses	
- Use taxis to free radial routes during peak period	
- Contract out portions of existing service	
o **Actions to Ensure Adequate Fuel**	
- Rely on current supplier	37
- Obtain emergency allocation from local or state government	33
- Obtain reserve fuel supply	24
- Something else:	10
- Expand storage capacity at fueling sites	
- Reduce low-priority service	
- Ration fuel	
o **Actions to Provide Additional Personnel (e.g., drivers, mechanics, telephone information operators)**	
- Use overtime or extended shifts	37
- Hire and train additional personnel	29
- Reemploy retired personnel on a temporary basis	20
- Contract with local carriers, other operators for drivers, mechanics	10
- Something else:	6
- Use part-time staff	
- Limit or cancel vacation time	
- Use mechanics from city motor pool and street maintenance	

TABLE 4: ELEMENTS OF ENERGY CRISIS CONTINGENCY PLANS (Continued)

Description of Element	Number of Responses
o Actions to Inform Transit Riders and the General Public	
- Expand customer assistance and transit information capabilities	40
- Implement public information program (press conference, news releases to local media)	29
- Something else:	3
- Encourage major employers to provide transit and ride-sharing information	
o Actions to Finance the Plan	
- Obtain a subsidy from local and/or state government	27
- Impose a temporary fare increase	17
- Use reserve funds	6

Time Required to Implement the Plan (A-10)

Nearly half (46 percent) the 50 systems who have contingency plans do not know how long it would take to implement their plans. Of those who are able to estimate the weeks it would take to put their plans into action, most (20) report it would take between one and six weeks. Six could put their plans into action in two weeks or less; eight estimate it would take between two and four weeks; and six would need between four and six weeks. Two systems would need more than six weeks.

Financial and Technical Assistance (A-11)

Nearly two-thirds (62 percent) of the respondents with contingency plans received some form of financial and/or technical assistance. Twenty systems received support from UMTA, three from other federal sources and four from local or state governments. Fifteen respondents received no assistance at all in the development of their plans.

Systems Without Contingency Plans (A-13 - A-14)

Among the 50 respondents who do not have an energy crisis contingency plan, less than a third (28 percent) intend to develop one. Half of those without a plan do not know if they would develop a plan in the future, and about a fifth (18 percent) do not intend to develop a contingency plan. In explaining why they do not now have a plan or intend to develop

one, the following rationales were given, as shown in Table 5. (Note: some respondents checked more than one rationale.)

TABLE 5: RATIONALES FOR NOT HAVING A CONTINGENCY PLAN

Rationale	Number of Responses
o Limited staff precludes this kind of planning	19
o With the current oil surplus, contingency planning is not a priority issue	8
o Financial assistance is needed	8
o If a crisis develops, we will have sufficient lead time to prepare a response	3

B. ENERGY CONSERVATION: OPERATING FACILITIES

Number of Operating Facilities (B-1)

Two-thirds (65 percent) of the respondents to the survey have one bus maintenance, repair and operation base, while a quarter (24 percent) have two to five bases, and a tenth (9 percent) have 6 or more. As might be expected, the number of bases corresponds very closely to the size of the system. For example, with only one exception, those systems with fleets of 500 or more have at least three facilities, with many reporting 5 or more. However, only a few (7) of the systems with 250 or fewer buses have more than one facility.

Energy Conservation Measures Implemented or Planned (B2 - B-4)

In responding to this section of the questionnaire, transit systems indicated what energy conservation measures in each of five categories they have implemented, plan to implement or do not plan to implement. The responses to this section are described in Table 6.

TABLE 6: ENERGY CONSERVATION MEASURES IMPLEMENTED OR PLANNED

Description of Conservation Measures	Number Who Have Implemented or Plan to Implement the Measure	Number Who Do Not Plan to Implement the Measure
o **Building Envelope (walls, roofs, doors and windows)**		
- Weatherstripping, caulking of doors, windows	53	21
- Added insulation in roof	38	36
- Enclosed entry to doorways	36	31
- Reduced window areas	34	37
- Storm windows or additional glazing	33	74
- Added insulation in walls	33	43
o **Lighting**		
- Installation of more energy efficient bulbs, fixtures	53	22
- Local or individual switching for lights	50	34
- Reduced lighting levels (decreased wattage, number of bulbs)	49	26
- Increased use of natural light (skylights)	35	41
- Increased frequency of cleaning and maintenance of light fixtures	35	38
o **Heating, Ventilating, Air Conditioning (HVAC)**		
- Lower thermostat settings during heating season	79	6
- Higher thermostat settings during cooling season	75	14
- Night setback thermostats	62	20
- Tamper-proof thermostats	58	26

TABLE 6: ENERGY CONSERVATION MEASURES IMPLEMENTED OR PLANNED (Continued)

Description of Conservation Measures	Number Who Have Implemented or Plan to Implement the Measure	Number Who Do Not Plan to Implement the Measure
- HVAC system shut off during hours when building is unoccupied	53	27
- Insulation of ducts, pipes	46	31
- Installation of more efficient boiler or furnace	39	36
- Reduced quantity of outside air intake	33	43
- Installation of heat recovery devices	26	50
- Conversion to more efficient/less expensive fuel source	21	51
o **Domestic Hot Water**		
- Lowered hot water temperature	49	27
- Insulation of hot water pipes	40	32
- Flow restriction devices on faucets/ shower heads	20	56
o **Solar and Alternative Energy Sources**		
- Waste oil burners	17	62
- Heat pump	15	63
- Waste heat recovery (e.g., heat wheel, heat exchanger)	15	61
- Passive solar for heating, domestic hot water, other purposes	15	62
- Active solor for heating	9	65
- Cogeneration, or multiple use of one energy source, e.g., generation of steam for heating and to power machinery	5	67

As Table 6 shows, the following conservation measures have been implemented or are planned by 50 percent or more of the respondents:

- Lower thermostat settings during heating season (79 percent)
- Higher thermostat settings during cooling season (75 percent)
- Night setback thermostats (62 percent)
- Tamper-proof thermostats (58 percent)
- HVAC system shut off during hours when building is unoccupied (53 percent)
- Weather stripping, caulking of doors, windows (53 percent)
- Installation of more energy-efficient bulbs, fixtures (53 percent)
- Local or individual switching for lights (50 percent)

Five of these most popular conservation measures involve adjustments to heating, ventilating and air conditioning (HVAC) systems, largely through operation of thermostatic controls. In addition, nearly all of these measures correspond to those no-cost/low cost conservation actions that have been highly recommended by government agencies, such as the U. S. Department of Energy.

In contrast to these more popular conservation measures, eight of the possible actions are not planned by 50 percent or more of the respondents. These include all five of the measures under the solar and alternative energy category (B-4), all of which were rejected by 60 percent or more of the respondents, as well as three others:

- Flow restriction devices on faucets, shower heads (56 percent)
- Conversion to more efficient/less expensive fuel source (51 percent)
- Installation of heat recovery devices (50 percent)

With only a few exceptions, most of these less popular conservation measures involve either considerable capital investment or application of less traditional and more innovative technologies. However, one measure--installing flow restrictors on showers and faucets--is an inexpensive action that has been promoted by various utilities in various sections of the country.

Most Successful Conservation Measures (B-5)

The same preference for no-cost/low-cost conservation measures that focus on heating, ventilating and air conditioning (HVAC) systems shows up in the respondents' lists of the five most successful conservation measures they have implemented. Of the 185 items listed by respondents, two-fifths (40 percent) involve adjustments or improvements to the HVAC system, and about two-thirds (63 percent) of these involve adjustments of the thermostatic control system, such as reducing or raising thermostat settings (30) and installing tamper-proof thermostats (6). By contrast, only two of the total list of 185 items involve solar energy measures. A more detailed list of the conservation measures

judged most successful by the respondents is shown in Table 7, with the more frequently mentioned items listed first.

TABLE 7: MOST SUCCESSFUL CONSERVATION MEASURES

Description of Conservation Measure	Number of Responses
o **Heating, Ventilating and Air Conditioning (Total Responses = 76)**	
- Reduced/raised thermostat settings	38
- Tamper-proof thermostats	6
- Ceiling fans to move heated air down to occupants	7
- New boiler and HVAC system	5
- Radiant heating system	3
- HVAC system shut off during unoccupied periods	3
- Heat recovery devices	3
- Other	11
o **Building Envelope (Total Responses = 53)**	
- Reduce heat loss through open service doors	26
- Promotion/enforcement of "close the door" policy for employees	9
- Plastic strips of air curtains	7
- Automatic door closing devices	4
- Reduced number of service doors	4
- Insulation for service doors	2
- Additional insulation in walls, roof	8
- Weather stripping/caulking of doors and windows	6
- Storm windows or thermopane glass	5
- Reduced window area	3
- Other	5

TABLE 7: MOST SUCCESSFUL CONSERVATION MEASURES (Continued)

Description of Element	Number of Responses
o **Lighting (Total Responses = 37)**	
- Energy-efficient lamps and fixtures	11
- Promotion of a "switch off the lights" policy	10
- Reduced number of fixtures or lamp wattage	7
- Other	9
o **General/Miscellaneous (Total Responses = 13)**	
- Employee energy awareness program	5
- Energy audit study	2
- General preventive maintenance	2
- Other	4
o **Domestic Hot Water (Total Responses = 3)**	
- Reduced hot water temperature	3
o **Solar/Alternative Energy (Total Responses = 3)**	
- passive solar energy	2
- Heat pump	1

Effectiveness of Conservation Measures (B-6)

In assessing how effective conservation measures have been in reducing energy consumption in their facilities, about half (47 percent) the respondents either do not know or did not provide an answer. Those who were able to provide an actual or estimated savings report reductions ranging from 1 to 40 percent. However, more report savings between 1 and 9 percent (27) then between 10 and 19 percent (15), while only 8 systems report annual energy savings of 20 percent or more.

Conservation Measures Involving Service Doors (B-7 - B-8)

As might be predicted from the relatively large number of systems that list reductions of heat loss through service doors as one of their five most successful energy conservation measures, fully two-thirds (66 percent) of the respondents report open service doors in maintenance and repair areas as a major source of energy loss. Some systems have taken more than one action to correct this problem. The most popular actions, in order of frequency or response, are listed in Table 8.

TABLE 8: ACTIONS TO REDUCE HEAT LOSS THROUGH SERVICE DOORS

Description of Action	Number of Responses
o Employee awareness program to keep doors closed	54
o Automatic photo-cell door openers	18
o Infrared/radiant heating system	17
o Plastic door strips in the door opening	16
o Air curtains in door openings	18
o Doors interlocked with heating control system	7
o Something else	9

Use of Energy-Efficient Technology in Facility Construction (B-9)

Sixty-five of the respondents have used energy-efficient technology and/or design within the past five years in the construction of new facilities, and 34 have used energy-efficient design in the rehabilitation of existing facilities. However, a fifth (22) of the respondents have not used energy-efficient technology or design either in the construction of new facilities or in the rehabilitation of existing ones.

Comprehensive Energy Audits (B-10)

A third (33 percent) of the survey participants report that they have not conducted a comprehensive energy audit of their facilities and do not plan to. However, 18 operators who have not yet conducted such a study plan to, and half (49 percent) of the respondents have already conducted such a study. Slightly more of those who report having undertaken an energy audit have used the assistance of outside consultants than those who relied on their own staff. Several operators used a combination of consultants and internal staff.

Tracking Energy Consumption and Costs (B11)

Two-thirds (65 percent) of the respondents have a method for tracking energy consumption and/or costs in their facilities, while 27 percent report they do not. Of those

who do have such a method, twice as many report that their method enables them to track both cost and consumption units, such as kilowatt hours of electricity and therms of natural gas, than those whose method tracked costs only.

Energy Consumption Characteristics of Facilities (B-12 - B-14)

The responses to items B-12, 13 and 14 provide a broad look at the average annual energy use in bus maintenance, repair and maintenance bases located in various areas in the country. Table 9 shows the location by state, the number of facilities and the average annual energy use for 1981, expressed in British Thermal Units (BTUs) per square foot.

TABLE 9: ANNUAL ENERGY USE IN TRANSIT FACILITIES

Location	Number of Facilities	Annual Energy Use in BTUs Per Square Foot
Alberta	3	65,705
Alberta	5	202,103
California	1	70,147
California	1	44,847
Colorado	5	142,421
Florida	4	121,111
Florida	1	152,455
Kentucky	1	59,903
Hawaii	2	58,168
Illinois	1	25,484
Iowa	1	51,701
Maryland	5	176,826
Massachusetts	1	72,517
Nevada	1	111,376
New York	3	26,460
Ohio	1	72,697
Ontario	1	111,242
Ontario	1	199,110
Oregon	3	55,408
Pennsylvania	1	65,217
Pennsylvania	1	31,478
Texas	1	36,511
Texas	2	14,930
Texas	5	39,433
Virginia	2	45,700
Wisconsin	1	177,584

Because many variables affect energy use, such as climate, hours of operation, the condition and age of the building and energy conservation measures implemented in the building, the data in Table 9 are useful only to indicate a general range of the amount of energy used in transit facilities. As reported by the respondents, annual energy use ranged from a low of 14,930 BTUs/square foot to a high of 202,103 BTUs/square foot, with a median reported use of 65,705 BTUs/square foot and an average of 85,790 BTUs/square foot.

Energy Manager or Conservation Coordinator (B-15)

Three-quarters of the respondents do not have a designated energy manager or conservation coordinator responsible for energy conservation in their operating facilities. However, about a fifth (18 percent) do have such a designated staff person. In general, the more facilities a system has, the higher the proportion of systems with energy managers. For example, of the 63 agencies with 1 facility who responded to this question, only 11 percent (7) have an energy manager. However, of the 20 agencies with 4 or more facilities who responded to this question, 20 percent (8) have an energy manager or coordinator.

C. ENERGY CONSERVATION: ROLLING STOCK

Training Program for Energy-Efficient Driving Techniques (C1)

Slightly more than half (55 percent) the survey participants either have already implemented or plan to implement a training program to encourage energy-efficient driving practices among their bus drivers. Of these, 16 have implemented such a program and 39 plan to. Two-fifths of the respondents have neither implemented such a program nor plan to do so.

Elements of Energy-Efficient Driver Training Programs (C-2)

Of the 55 systems that have already implemented or planned to implement an energy-efficient driver training program, the following elements were included in their programs, as shown in Table 10.

TABLE 10: ELEMENTS OF DRIVER TRAINING PROGRAM

Program Element	Number of Responses
o Avoiding sudden stops and acceleration	46
o Anticipatory driving to coast into stops	43
o Turning engine off during layover	38
o Limiting engine warm-up (e.g., not racing cold engines, restricting engine warm-up period)	35
o Avoiding gear use that lugs the engine	17
o Reducing freeway speed	11
o Something else:	9
- Driver retraining program	
- Using tachographs to monitor driver performance, with retraining as necessary	
- Turn off air conditioning when climbing hills	

Increase in Fuel Efficiency Due to Training Programs (C3)

Only 15 respondents provided an estimate or an actual figure of the percentage increase in their fleet's fuel efficiency as a result of training programs in energy-efficient driving practices. Of these 15, most (10) report such savings evenly split between 1 and 4 percent and 5 and 9 percent. For 3 systems, fuel efficiency has increased between 10 and 14 percent. One reports more than 15 percent increase in fuel efficiency, and another reports no savings at all.

Fuel Conservation Measures (C-4)

In addition to driver training programs, survey participants were asked to indicate other fuel conservation measures they have implemented. The responses are shown in Table 11.

TABLE 11: FUEL CONSERVATION MEASURES IMPLEMENTED OR PLANNED

Description of Conservation Measures	Number Who Have Implemented or Plan to Implement the Measure	Number Who Do Not Plan to Implement the Measure
o Increased monitoring of maintenance and repair records to identify inefficient operations	81	12
o Increased monitoring of fuel consumption records to identify worst offenders	74	17
o Switching from exlcusive use of #1 diesel to #2 diesel, or a mix of both	67	26
o Increased frequency of routine maintenance (tune-ups, wheel alignment and balance, tire pressure, cleaning air intake system, etc.)	65	28
o Use of more efficient oils and greases	41	41
o Use of radial instead of bias-ply tires	28	56
o Use of brake retarder devices	26	56
o Use of fuel additives	19	64
o Fuel conversion, from diesel or gasoline to propane, CNG (compressed natural gas) or some other alternative fuel.	8	71
o Installation of transmission device to idle engine when stopped	4	72

As Table 11 indicates, more than 50 percent of the respondents have implemented or plan to implement one or more of the first four measures in the list, while 41 percent or less have implemented or plan to implement the last six measures. These results are similar to the findings for conservation measures designed to save energy in facilities: The more popular measures involve no or only minimal costs, while the less popular measures involve some significant capital investment, such as acquiring brake retarder devices or converting equipment to run on alternative fuels.

Reduction of Fuel Consumption Due to Conservation (C-5)

Thirty systems provided estimates of the reduction in fuel consumption they have realized as a result of the fuel conservation measures listed in Table 11. Of these 30, most (25)

report fuel reductions of up to 9 percent; however, 7 of these have savings of less than 1 percent. Five systems report fuel reduction by 10 percent or more.

Most Successful Fuel Efficiency Improvements (C-6)

Fully half the survey respondents did not respond to this question, which asked for a list of the five actions that have been most successful in improving the fuel efficiency of the system's petroleum-fueled fleet. However, the 50 that did respond listed 136 actions that have improved the efficiency of their fleets. Of these 136 actions, about a third (32 percent) involve general maintenance programs, a fifth (19 percent) involve energy-efficient driving practices, and another fifth (17 percent) fall into the category of fuel-related measures, such as switching from use of #1 diesel fuel to #2. The rest of the responses fall into miscellaneous groupings. A more detailed list of the fuel efficiency measures judged most effective by the respondents is shown in Table 12, with the more frequently mentioned actions listed first.

TABLE 12: MOST SUCCESSFUL FUEL CONSERVATION MEASURES

Description of Measure	Number of Responses
o Maintenance Programs (Total Responses = 44)	
- Increased or ongoing general preventive maintenance	21
- More frequent tune-ups	10
- Air filter and intake maintenance	4
- Maintenance monitoring program	4
- Other: training program for maintenance staff, chassis dyno monitoring	5
o Driver Behavior/Efficient Driving Techniques (Total Responses = 26)	
- Energy-efficient driving program	12
- Decreased idling time	7
- Other: reduced speeds, turn off engines during layover	7
o Fuel-Related Measures (Total Responses = 23)	
- Switch from exclusive use of #1 diesel fuel to partial or total use of #2	11
- Other: fuel monitoring, improved fuel quality, use of additives, waste oil and diesel blending	12

TABLE 12: MOST SUCCESSFUL FUEL CONSERVATION MEASURES (Continued)

Description of Measure	Number of Responses
o **Miscellaneous (Total Responses = 43)**	
- Use of radial tires	6
- Addition of more energy-efficient buses to the fleet	5
- Replacement of fuel injectors with more efficient devices	4
- Tire pressure monitoring program	3
- Smaller engine size	3
- Turbo engines	3
- More Efficient oils, lubes and greases	3
- Other: Reduced number of deadhead miles through TSM, restricted use of air conditioning, oil additives, brake adjustment, engine rebuilding	16

D. ENERGY CONSERVATION: GENERAL

Energy Conservation Awareness Program (D-1)

Two-fifths (41 percent) of the survey respondents have already implemented or plan to implement an energy conservation awareness program for their personnel. Of these, 19 have put such a program into place and 22 are planning a program. Fifty-seven percent of the survey participants have not considered a program of this kind.

Elements of a Conservation Awareness Program (D-2)

The 41 systems that have implemented or are planning to implement a conservation awareness program said their program included one or more of the elements in Table 13.

TABLE 13: ELEMENTS OF CONSERVATION AWARENESS PROGRAMS

Description of Program Element	Number of Responses
o Signs, notices promoting energy conservation by switching off lights and/or closing doors	35
o Employee suggestion program for conserving energy	19
o Distribution of brochures and articles in employee newsletters describing ways to save energy	18
o Conservation teams, "quality circles" or similar techniques for directly involving employees in the conservation program	8
o In-house competition among employees at different bases or operating facilities to save energy	5
o Something else	7

Response of Employees and Others to Conservation Programs (D-3)

In evaluating the response of various groups to their conservation programs, respondents report a significant level of support from their administrations and governing boards, but more mixed support from employees, as shown in Table 14.

TABLE 14: RESPONSE TO CONSERVATION PROGRAMS

	Degree of Response		
Group	Excellent/ Good	Fair/ Poor	Unknown
o Administrative Personnel	31	7	9
o Drivers	23	22	12
o Maintenance Personnel	21	19	9
o Labor Union	9	10	22
o Governing Board	23	9	12
o General Public	12	9	25

E. FUEL SUPPLY AND PRICE PROTECTION

Reserve Fuel Storage (E-1 - E-5)

About a third (30 percent) of the survey participants have a reserve supply of fuel to protect themselves from fuel supply disruptions. Of these 14 constructed their reserve, 11 bought it and three lease the storage capacity. Two did not indicate how they acquired their reserve.

Most of the 30 systems with a reserve use it to store diesel fuel. Seventeen store diesel exclusively and 10 reported having reserve supplies of both diesel and gasoline. Half of the 30 systems have storage capacity for 50,000 or fewer gallons of diesel fuel, with most (11) of these being under 25,000. Ten systems have reserves with a capacity of between 50,001 and 100,000 gallons of diesel. Four have even larger storage capacities, two of which are over 1,000,000 gallons.

In terms of the number of days of operating requirements represented by the reserve, 23 systems have sufficient storage to meet up to a month's operating requirements. Of these, 13 have 2 weeks or less and 10 have between 2 weeks and a month. Three systems report having a reserve that could meet between 1 and 3 month's operating requirements, and 4 have reserves large enough to meet more than 3 months of operating requirements.

Of the 67 systems that did not report having a fuel reserve, 20 plan to acquire one, 41 have no plans to do so at this time and 6 did not respond.

Special Rule #9 (E-6)

Under Executive order 12287, issued January 28, 1981, the U. S. Department of Energy discontinued Special Rule #9. This rule had assured surface mass transit of 100 percent of its diesel fuel requirements in the event of a fuel supply shortage. More than half (57%) the survey respondents believe the loss of Special Rule #9 could have a very or somewhat serious impact on transit operations. Fifteen percent think it would have a not very serious effect or no impact at all. Ten systems report that they do not know what the effect might be, and 18 did not respond. (Included amoung the non-respondents were the systems from Canada, where the rule did not apply.)

Protection Against Fuel Supply Disruptions (E-7)

In addition to a fuel reserve, survey participants were asked to indicate what other measures they have implemented or plan to implement that would protect them from a disruption in fuel supplies. The responses are shown in Table 15.

TABLE 15: FUEL CONSERVATION MEASURES IMPLEMENTED OR PLANNED

Description of Measures	Number Who Have Implemented or Plan to Implement the Measure	Number Who Do Not Plan to Implement the Measure
o Assured supply agreement with a fuel supplier to guarantee delivery of a predetermined volume of fuel on demand	50	38
o Long-term fuel contract with a major supplier, i.e., not a middle-man or a jobber	43	36
o Reliance on emergency state or federal action	39	28
o Informal understanding with current supplier	33	29
o Arrangements to obtain emergency fuel supply from city, county or other local jurisdiction	20	45

Protection Against Fuel Price Increase (E-8)

In addition to taking action to protect against fuel supply disruptions, some transit systems also have taken steps to protect themselves from sharp increases in fuel prices. The price protection measures listed in Table 16 were mentioned by respondents.

TABLE 16: MEASURES TO PROTECT AGAINST FUEL PRICE INCREASES

Description of Measures	Number Who Have Implemented or Plan to Implement the Measure	Number Who Do Not Plan to Implement the Measure
o Bulk fuel purchase	55	27
o Switching from purchase of fuel from middleman or jobber to direct purchase from major supplier	41	33
o Obtaining long-term contract (two or more years) from supplier	23	48
o Guaranteed or fixed-price fuel contract	18	51
o Hedging through heating oil futures	5	62

Energy Management Survey

Municipality of Metropolitan Seattle

INSTRUCTIONS

This survey is concerned with existing or planned energy management programs undertaken by transit agencies. It asks about activities such as energy crisis contingency planning, energy conservation for operating facilities and rolling stock, transit fuel reserves and fuel price and supply protection strategies.

The questionnaire can be completed quickly and easily. It should be filled out by the person or persons most familiar with energy-related programs.

Please answer all questions by marking the appropriate answer or filling in the requested information. If a question does not apply to you, mark it "N/A" — not applicable — and proceed to the next question.

If you have any questions or need additional information about the survey, please contact David Bryant, Energy Analyst, Seattle Metro, at (206) 447-6896.

IDENTIFYING INFORMATION

Name of Transit Agency _____

_____

City: _____ State _____

Person(s) completing the questionnaire

Name _____

Name _____

Name _____

A. ENERGY CRISIS CONTINGENCY PLANNING

1. **Does your agency have an energy crisis contingency plan?** Yes ☐ No ☐

(If you do not have a plan, omit questions A2-A12 and skip to question A13.)

2. **Has your agency ever implemented the plan?**
   Yes ☐ No ☐
   (Please specify period in effect): _____ (month/year) to _____ (month/year)

3. **If your agency has implemented the plan, how would you characterize its success in meeting the demands of a crisis?**
   Excellent ☐ Good ☐ Fair ☐ Poor ☐
   Indeterminate ☐

4. **When was the plan originally developed?**
   Month _____ Year _____

5. **Has the plan been revised or updated since it was developed?**
   Yes ☐ No ☐ (Please specify year): _____

6. **Is the plan currently in need of revision or further updating?**
   Yes ☐ No ☐ Don't know yet ☐

7. **Is the plan designed to deal with...**
   A short-term crisis lasting 1-6 weeks? ..... _____
   A long-term crisis lasting more than six weeks? ..... _____
   Both short and long-term crises? ..... _____

8. **According to your agency's plan, what actions, if any, would be taken to...**

   a. **Expand ridership?** (Mark all that apply)
   Utilize excess ridership capacity ..... ☐
   Promote flex-time, variable work hours ..... ☐
   Promote car and/or van pooling ..... ☐
   Increase number of coaches in service ..... ☐
   Curtail low ridership routes and concentrate equipment on high demand routes ..... ☐
   Something else (Please specify) ..... ☐
   _____
   _____
   _____

   b. **Obtain additional equipment?** (Mark all that apply)
   Activate reserve fleet ..... ☐
   Reduce spare ratio ..... ☐
   Lease coaches from private carriers, other operators ..... ☐
   Use school buses ..... ☐
   Something else (Please specify) ..... ☐
   _____
   _____
   _____

   c. **Ensure adequate fuel?** (Mark all that apply)
   Obtain reserve fuel supply ..... ☐
   Obtain emergency allocation from local or state government ..... ☐
   Rely on current supplier ..... ☐
   Something else (Please specify) ..... ☐
   _____
   _____
   _____

9. **What additional actions, if any, would be taken to...**

   a. **Provide additional personnel (drivers, mechanics, telephone information operators)?** (Mark all that apply)
   Hire and train additional personnel ..... ☐
   Use overtime/extended shifts ..... ☐
   Reemploy retired personnel on a temporary basis ..... ☐
   Contract with local carriers, other operators for drivers, mechanics ..... ☐
   Something else (Please specify) ..... ☐
   _____
   _____
   _____

b. **Inform transit riders and the general public?** (Mark all that apply)

Expand customer assistance/ transit information capabilities ☐
Implement public information program (press conference, news releases to local media) ☐
Implement marketing program (paid media spots, advertising) ☐
Something else (Please specify) ☐

_____

_____

_____

c. **Finance the planned actions?** (Mark all that apply)

Impose a temporary fare increase ☐
Use reserve funds ☐
Obtain a subsidy from local/state government ☐
Something else (Please specify) ☐

_____

_____

_____

10. How many weeks do you estimate it will take to implement the contingency plan?

Number of weeks _____ Don't know ☐

11. Did your agency receive financial and/or technical assistance to develop the plan?

Yes ☐ (Please specify source) _____

No ☐ _____

12. Who is the person in your agency who could be contacted for follow-up information on energy crisis contingency planning?

Name _____

Title _____

Telephone (_____) _____
Area Code

13. If you do not now have an energy crisis contingency plan, do you intend to develop one?

Yes ☐ (Please specify year): _____
No ☐ Don't know ☐

14. If you do not now have an energy crisis contingency plan and do not intend to develop one, which of the following statements best explains your rationale? (Mark all that apply)

With the current oil surplus, contingency planning is not a priority issue ☐
Limited staff precludes this kind of planning ☐
Financial assistance is needed ☐
If a crisis develops, we will have sufficient lead time to prepare a response ☐
Something else (Please specify) ☐

_____

_____

_____

B. ENERGY CONSERVATION: OPERATING FACILITIES (BUS MAINTENANCE, REPAIR AND OPERATION BASES)

1. How many separate operating facilities (i.e., bus maintenance, repair and operation bases) does your agency have?

Number of operating facilities _____

2. Which of the following energy conservation measures, if any, has your agency already implemented or plans to implement in its operating facilities?

a. Building Envelope (walls, roofs, doors, windows)	Already Implemented	Planned	Not Planned
Added insulation in walls	☐	☐	☐
Added insulation in roof	☐	☐	☐
Enclosed entry to doorways	☐	☐	☐
Storm windows or additional glazing	☐	☐	☐
Reduced window areas	☐	☐	☐
Weatherstripping, caulking of doors, windows	☐	☐	☐

Something else (Please specify) _____

_____

_____

_____

_____

_____

_____

b. Lighting	Already Implemented	Planned	Not Planned
Reduced lighting levels (decreased wattage, number of bulbs)	☐	☐	☐
Increased frequency of cleaning and maintenance of light fixtures	☐	☐	☐
Increased use of natural light (skylights)	☐	☐	☐
Installation of more energy efficient bulbs, fixtures	☐	☐	☐
Local or individual switching for lights	☐	☐	☐

Something else (Please specify) _____

_____

_____

_____

_____

_____

_____

3. **Which of these additional energy conservation measures, if any, has your agency implemented or plans to implement in its operating facilities?**

a. Heating, Ventilating, Air Conditioning (HVAC)	Already Implemented	Planned	Not Planned
Lower thermostat settings during heating season	☐	☐	☐
Higher thermostat settings during cooling season	☐	☐	☐
Night setback thermostats	☐	☐	☐
Tamper proof thermostats	☐	☐	☐
Insulation of ducts, pipes	☐	☐	☐
Installation of more efficient boiler or furnace	☐	☐	☐
Installation of heat recovery devices	☐	☐	☐
Conversion to more efficient/ less expensive fuel source	☐	☐	☐
Reduced quantity of outside air intake	☐	☐	☐
HVAC system shut off during hours when building is unoccupied	☐	☐	☐

Something else (Please specify)

_____

_____

_____

b. Domestic Hot Water	Already Implemented	Planned	Not Planned
Lowered hot water temperature	☐	☐	☐
Flow restriction devices on faucets/shower heads	☐	☐	☐
Insulation of hot water pipes	☐	☐	☐

Something else (Please specify)

_____

_____

_____

4. **Has your agency already implemented or does it plan to implement any of the following conservation measures involving solar energy or alternative energy sources?**

Passive solar for heating, domestic hot water, other purposes	☐	☐	☐
Active solar for heating	☐	☐	☐
Waste oil burners	☐	☐	☐
Heat pump	☐	☐	☐
Waste heat recovery (e.g. heat wheel, heat exchanger)	☐	☐	☐
Cogeneration, or multiple use of one energy source, e.g., generation of steam for heating and to power machinery	☐	☐	☐

Something else (Please specify)

_____

_____

_____

5. **Please list the five conservation measures your agency has already implemented that have been most successful in reducing energy consumption in its operating facilities.** (Please be specific)

a. _____

b. _____

c. _____

d. _____

e. _____

6. **Overall, by what percentage has your agency reduced the annual energy consumption in its operating facilities as a result of conservation?**

Percent savings in annual energy conservation _____

This is an actual ☐/estimated ☐ savings. (Please mark one).

7. **Many agencies have identified open service doors in maintenance and repair areas as a major source of energy loss. Is this condition a problem for your agency?**

Yes ☐ No ☐ Don't know ☐

8. **If open service bay doors are a problem for your agency, has any action been taken to correct it?**

No action taken yet ☐

Yes, action has been taken ☐
(Please mark all that apply)

a. Employee awareness program to keep doors closed during heating/cooling season ☐
b. Installation of plastic door strips in the door opening ☐
c. Installation of air current doors ☐
d. Installation of automatic photo-cell door operators ☐
e. Installation of infra-red/radiant heating system ☐
f. Doors interlocked with heating control system ☐
g. Something else (Please specify) ☐

_____

_____

_____

9. **Within the past five years has your agency used energy efficient technology and/or design in the construction of new facilities or in the rehabilitation of existing ones?** (Please mark all that apply)

Yes, in new construction ☐
Yes, in rehabilitation of existing facilities ☐
No ☐

10. **Has your agency conducted a comprehensive energy study or audit of its facilities to identify and evaluate conservation opportunities?**

Yes, by internal staff ☐
Yes, with assistance from outside consultants (private engineering firm, local utility, other) ☐
No, but such a study is planned ☐
No, no study has been conducted or planned ☐

11. Does your agency have a method for tracking energy consumption and/or costs in its facilities?

☐ Yes, by cost and consumption units

☐ Yes, by cost only No ☐

12. In 1981, what was the average annual fuel consumption for your agency's combined operating facilities (bus maintenance, repair and operation bases)?

		Actual	Estimate
Electricity:			
_____	kwh/year	☐	☐
Natural Gas:			
_____	therms/year	☐	☐
Heating Oil:			
_____	gallons/year	☐	☐
Purchased Steam:			
_____	pounds/year	☐	☐

13. What is the total area in square feet of your agency's combined operating facilities?

Number of square feet _____

14. Approximately what percentage of the area of these facilities is heated and/or cooled?

Percent heated only _____

Percent heated and cooled _____

Percent cooled only _____

Percent neither heated or cooled _____

15. Does your agency have a designated energy manager or conservation coordinator who is responsible for energy conservation in the operating facilities?

Yes ☐ No ☐

Name _____

Title _____

Telephone (_____) _____
Area Code

16. Who is the person in your agency who could be contacted for follow-up information on energy conservation?

Name _____

Title _____

Telephone (_____) _____
Area Code

C. ENERGY CONSERVATION: ROLLING STOCK (PETROLEUM-FUELED BUSES)

1. Has your agency implemented or planned a training program to promote energy-efficient driving practices for drivers of its petroleum-fueled fleet?

Implemented ☐ Planned ☐
Not implemented or planned ☐
(Skip to question C4)

2. If your agency has implemented or planned an energy-efficient driver training program, which of the following elements does it include? (Mark all that apply)

Turning off engine during layover ☐
Reducing freeway speed ☐
Avoiding gear use that lugs the engine ☐
Avoiding sudden stops and acceleration ☐
Limiting engine warm-up (not racing cold engines, restricting warm-up period) ☐
"Anticipatory" driving to coast into stops ☐
Something else (Please specify) ☐

_____

_____

_____

3. Overall, by what percentage has the operating efficiency of your agency's petroleum-fueled fleet been increased as a result of the driver training program? (Please indicate if actual figure or estimate).

Percentage increase
in operating efficiency _____

This is an actual ☐/estimated ☐ increase.
(Please mark one)

4. Which of the following fuel conservation measures, if any, has your agency already implemented or plans to implement for its petroleum-fueled fleet? (Mark all that apply)

	Already Implemented	Planned	Not Planned
Fuel conversion, from diesel or gasoline to propane, CNG (compressed natural gas) or some other alternative fuel	☐	☐	☐
Switching from exclusive use of #1 diesel to #2 diesel, or a mix of both	☐	☐	☐
Use of fuel additives	☐	☐	☐
Use of brake retarder devices	☐	☐	☐
Use of radial instead of bias-ply tires	☐	☐	☐
Use of more efficient oils and greases	☐	☐	☐
Increased frequency of routine maintenance (tune-ups, wheel alignment and balance, tire pressure, cleaning air intake system, etc.)	☐	☐	☐
Increased monitoring of maintenance and repair records to identify inefficient operation	☐	☐	☐
Increased monitoring of fuel consumption records to identify worst offenders	☐	☐	☐
Installation of transmission device to idle engine when stopped	☐	☐	☐

Something else (Please specify)

_____

_____

_____

5. **Overall, by what percentage has the fuel consumption of your agency's petroleum-fueled fleet been reduced as a result of these conservation measures?** (Please indicate if actual figure or estimate)

Percentage decrease in fuel consumption _____

This is an actual ☐/estimated ☐ savings. (Please mark one)

6. **Based on your agency's experience, what are the five actions that have contributed the most to improving the fuel efficiency of your petroleum-fueled fleet?** (Please be specific)

a. _____

b. _____

c. _____

d. _____

e. _____

7. **Who is the person in your agency who could be contacted for follow-up information on energy conservation for rolling stock?**

Name _____

Title _____

Telephone (_____) _____
Area Code

D. ENERGY CONSERVATION: GENERAL

1. **Has your agency implemented or planned an energy conservation awareness program for agency personnel?**

Implemented ☐ Planned ☐
Not considered ☐

2. **If your agency has implemented or planned such a program, which of following elements does it include?** (Mark all that apply)

Signs, notices promoting energy conservation by switching off lights, closing doors ☐

Employee suggestion program for saving energy ☐

Conservation teams, "quality circles," or similar techniques for directly involving employees in conservation program ☐

Distribution of brochures, articles in employee newsletters describing ways to save energy ☐

In-house competition among employees at different bases or operating facilities to save energy ☐

Something else (Please specify) ☐

_____

_____

_____

_____

_____

3. **How would you judge the responsiveness of each of the following groups to your agency's conservation efforts?**

	Excellent	Good	Fair	Poor	Unknown
a. Administration personnel	☐	☐	☐	☐	☐
b. Drivers	☐	☐	☐	☐	☐
c. Maintenance personnel	☐	☐	☐	☐	☐
d. Labor union	☐	☐	☐	☐	☐
e. Governing board	☐	☐	☐	☐	☐
f. General public	☐	☐	☐	☐	☐

E. FUEL SUPPLY AND PRICE PROTECTION

1. **As a protection against disruption of their fuel supplies, some transit agencies have acquired a reserve storage of fuel. Does your agency have such a reserve?**

Yes ☐
No ☐
(Omit questions E2-E4 and skip to question E5)

2. **Did your agency buy, construct or lease the reserve storage?**

Bought ☐ Constructed ☐ Leased ☐

3. **What is the capacity of the reserve?**

Number of gallons of diesel fuel _____

Number of gallons of gasoline _____

Number of gallons of other fuel _____

Type of other fuel _____

4. **How many days of your agency's current operating requirements does this capacity represent?**

Days of operating requirements _____

5. **If your agency does not now have a fuel reserve, does it plan to acquire one?**

Yes ☐ Planned capacity in gallons _____
No, not at this time ☐

6. **Under Executive Order 12287, issued January 28, 1981, the U.S. Department of Energy discontinued Special Rule #9, which assured surface mass transit of 100 percent of diesel fuel requirements in the event of a fuel supply shortage. How would you characterize the potential impact of this action on your transit operations?**

Very serious ☐ Somewhat serious ☐
Not very serious ☐ No impact at all ☐
Don't know ☐

7. **In addition to acquiring a fuel reserve, there are other measures a transit system can take as protection against fuel supply disruptions. Which, if any, of the following supply protection measures has your agency already implemented or plans to implement?** (Mark all that apply)

	Already Implemented	Planned	Not Planned
Assured supply agreement with a fuel supplier to guarantee delivery of a pre-determined volume of fuel on demand	☐	☐	☐
Long-term fuel contract with a major supplier, i.e., not a middleman or jobber	☐	☐	☐
Arrangement to obtain emergency fuel supply from city, county, or other local jurisdiction	☐	☐	☐
Reliance on emergency state or federal action	☐	☐	☐
Informal understanding with current supplier	☐	☐	☐

Something else (Please specify)

_____

_____

_____

8. **In addition to protecting against fuel supply disruptions, some transit agencies have taken steps to protect themselves against increases in fuel prices. Which, if any, of the following price protection strategies has your agency already implemented or plans to implement?** (Mark all that apply)

	Already Implemented	Planned	Not Planned
Bulk fuel purchase	☐	☐	☐
Hedging through heating oil futures	☐	☐	☐
Switching from purchase of fuel from middleman or jobber to direct purchase from major supplier	☐	☐	☐
Obtaining long-term contract (two or more years) from supplier	☐	☐	☐
Guaranteed/fixed price contract	☐	☐	☐

Something else (Please specify)

_____

_____

_____

9. **Who is the person in your agency who could be contacted for follow-up information on fuel supply and price protection?**

Name _____

Title _____

Telephone (_____) _____
Area Code

Thank You For Your Participation

Please indicate whether you wish to receive a summary of the results of this survey and copies of the technical assistance guidebooks listed below. These publications will be available later in 1982.

_____ Summary Report on Energy Management Survey

_____ Energy Crisis Contingency Planning Guidebook

_____ Energy Conservation Guidebook for Transit Operating Facilities

_____ Transit Fuel Reserve Guidebook

_____ Energy Conservation Guidebook for Rolling Stock

Send these publications to:

Name _____

Title _____

Agency _____

Address _____

City _____

State _____ Zip _____

*U.S. GOVERNMENT PRINTING OFFICE : 1983 0-381-428/3022

NOTICE

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Goverment assumes no liability for its contents or use thereof.

This document is being distributed through the U.S. Department of Transportation's Technology Sharing Program.

DOT-I-83-01

HE 203 .A56
Transportati
management
Form DOT F 17
FORMERLY FORM D

DOT-I-83-01

DOT LIBRARY
00014693

TECHNOLOGY SHARING

SPECIAL STUDIES IN TRANSPORTATION PLANNING (SSTP)

PROGRAM OF THE U.S. DEPARTMENT OF TRANSPORTATION